

## WHAT IS CLAIMED IS:

1. A friction stir welding method, comprising the steps of:

abutting an end portion of a first member and an end portion of a second member, thereby providing an abutting portion,

each of said first member and said second member having a first plate, a second plate which is arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

wherein said end part of said first plate projects beyond said end part of said second plate, and wherein at said abutting portion said end part of said first plate of said first member abuts said end part of said first plate of said second member;

under a condition where a rotary tool is inserted to said abutted portion from a side of said second plate, carrying out a friction stir welding of said abutted portion, to form substantially flat a face of said abutted portion; and

thereafter, welding a fourth plate to said second plate of said first and second members from an outer side of said first member and an outer side of said second member.

2. A friction stir welding method according to claim 1,

wherein the friction stir welding is carried out under a condition where a backing plate is located adjacent said abutted portion, and

wherein the friction stir welding is carried out to form substantially a flat face of the first and second members adjacent said backing plate.

3. A friction stir welding method according to claim 1, wherein said welding said fourth plate welds said fourth plate to a connection portion of said second plate and said third plate of at least one of the first and second members.

4. A friction stir welding method according to claim 3, wherein the welding of said fourth plate and said connection portion of said second plate and said third plate is carried out by friction stir welding.

5. A friction stir welding method according to claim 3, wherein:  
each of said first and second members has a recessed portion which opens directing toward an outer side in a thickness direction of said members and said end portion side of said second plate toward a connection portion of said second plate and said third plate;

after the friction stir welding, overlapping respective end portions of said fourth plate to said respective recessed portions; and

thereafter, welding the respective end portions of said fourth plate to said respective first and second members.

6. A friction stir welding method according to claim 5, wherein the welding of said fourth plate and said connection portion is carried out by friction stir welding.

7. A friction stir welding method according to claim 6, wherein:

said fourth plate is positioned to overlap said recessed portion and abut said end portion of said fourth plate to an end portion of said second plate of said first member, providing another abutted portion; and

the friction stir welding of the fourth plate and the connection portion is carried out at said another abutted portion.

8. A friction stir welding method according to claim 6, wherein:

said third plate of said first member is substantially orthogonal to said first plate of said first member; and

the friction stir welding of said fourth plate and said connection portion is carried out by positioning said rotary tool in a range of an extension line in a thickness of said third plate.

9. A friction stir welding method according to claim 6, wherein the friction stir welding of said fourth plate to said third plate is carried out using said rotary tool.

10. A friction stir welding method according to claim 3, wherein the friction stir welding of said fourth plate to said third plate is carried out using said rotary tool.

11. A friction stir welding method according to claim 1, wherein friction stir welding is carried out so as to weld said fourth plate to said second plate of the first member.

12. A friction stir welding method according to claim 11, wherein:  
after the friction stir welding, the fourth plate is abutted to an end portion of said second plate of said first member, thereby providing another abutted portion; and  
friction stir welding is carried out at said another abutted portion.

13. A friction stir welding method according to claim 11, wherein:  
each of said first and second members has a recessed portion which opens directly toward an outer side in a thickness direction of said members and said end portion side of said second plate toward a connection portion of said second plate and said third plate;  
after the friction stir welding, overlapping respective end portions of said fourth plate to said respective recessed portions; and  
next welding the respective end portions of said fourth plate to said first and second members.

14. A manufacturing method of a structure body, comprising the steps of:  
abutting an end portion of a first member and an end portion of a second member, thereby providing an abutted portion,

each of said first member and said second member having a first plate, a second plate which is arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

wherein said end part of said first plate projects beyond said end part of said second plate, and wherein at said abutting portion said end part of said first plate of said first member abuts said end part of said first plate of said second member;

under a condition where a rotary tool is inserted to said abutted portion from a side of said second plate, carrying out a friction stir welding of said abutted portion, to form substantially flat a face of said abutted portion;

thereafter, welding a fourth plate to said second plate of said first and second members from an outer side of said first member and an outer side of said second member, thereby forming an obtained structure; and

manufacturing the structure body by positioning the first plates of said obtained structure at an outer face of the structure body.

15. A manufacturing method of a structure body according to claim 14,

wherein the friction stir welding is carried out under a condition where a backing plate is located adjacent said abutted portion, and

wherein the friction stir welding is carried out to form substantially a flat face of said first and second members adjacent said backing plate.

16. A manufacturing method of a vehicle structure body, comprising the steps of:

abutting an end portion of a first member and an end portion of a second member, thereby providing an abutted portion,

each of said first member and said second member having a first plate, a second plate which is arranged substantially parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

wherein said end part of said first plate projects beyond said end part of said second plate, and wherein at said abutting portion said end part of said first plate of said first member abuts said end part of said first plate of said second member;

under a condition where a rotary tool is inserted to said abutted portion from a side of said second plate, carrying out a friction stir welding of said abutted portion, to form substantially flat a face of said abutted portion;

thereafter, welding a fourth plate to said second plate of said first and second members from an outer side of said first member and an outer side of said second member, thereby forming an obtained structure; and

manufacturing the vehicle structure body by positioning the first plates of said obtained structure at an outer face of the vehicle structure body.

17. A manufacturing method of a vehicle structure body according to claim 16,

wherein the friction stir welding is carried out under a condition where a backing plate is located adjacent said abutted portion, and

wherein the friction stir welding is carried out to form substantially a flat face of said first and second members adjacent said backing plate.

18. Vehicle structure body formed by the manufacturing method of claim 17.

19. Vehicle structure body formed by the manufacturing method of claim 16.

20. Structure body formed by the manufacturing method of claim 14.

21. Product formed by the method of claim 1.

22. A structure body, comprising:

a first member and a second member, each having a first plate, a second plate which is arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

said end part of said first plate is projected beyond said end part of said second plate,

said end parts of the first plates are welded from a side of the second plates by a friction stir welding, thereby forming a welded portion, and an opposite side of said first plates is formed substantially flat, and

respective end portions of a fourth plate are welded to the second plates of said first and second members.

23. A structure body according to claim 22, wherein in said welded portion, a face of the first plates opposite to that facing the second plates is substantially flat.

24. A structure body according to claim 22, wherein the welding of said fourth plate and said second plates is a friction stir welding.

25. A structure body according to claim 24, wherein the welding of said fourth plate is between the fourth plate and a connection portion between the second and third plates, and is a friction stir welding.

26. A structure body according to claim 24, wherein an outer face of said second plates and an outer face of said fourth plate are substantially in a same plane.

27. A structure body according to claim 26, wherein the welding of said fourth plate is between the fourth plate and a connection portion between the second and third plates, and is a friction stir welding.

28. A structure body according to claim 27, wherein an end portion of said fourth plate is abutted to said second plate of said first member and is welded thereto by a friction stir welding.

29. A structure body according to claim 27, wherein:



said third plate is substantially orthogonal to said first plate; and  
a bead of the friction stir welding of the fourth plate to the second plate of the first member is positioned in a range of an extension line in a thickness of said third plate.

30. A structure body according to claim 27, wherein said fourth plate is welded to said third plate.

31. A structure body according to claim 24, wherein said fourth plate is welded to said third plate.

32. A structure body according to claim 22, wherein said fourth plate is welded to said third plate by a friction stir welding.

33. A structure body according to claim 32, wherein said fourth plate is welded to said second plate of said second member by abutting an end portion of said fourth plate to an end part of said second plate of said first member, and then performing welding by a friction stir welding.

34. A structure body according to claim 32, wherein an outer face of said second plate and an outer face of said fourth plate are substantially in a same plane.

35. A structure body, comprising:

a first member and a second member, each having a first plate, a second plate which is arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

said end part of said first plate is projected beyond said end part of said second plate,

said end parts of said first plates are welded from a side of the second plates by a friction stir welding, and an opposite side of said first plates is substantially flat,

respective end portions of a fourth plate are welded to said second plates of said first and second members, and

the structure body is formed by directing a side of said second plates to an inner side of the structure body.

36. A vehicle structure body, comprising:

a first member and a second member, each having a first plate, a second plate which is arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

said end part of said first plate is projected beyond said end part of said second plate,

said end parts of said first plates are welded from a side of the second plates by a friction stir welding, and an opposite side of said first plates is substantially flat,

respective end portions of a fourth plate are welded to said second plates of said first and second members, and

the vehicle structure body is formed by directing a side of said second plates to an inner side of the vehicle structure body.

37. A friction stir welding method, comprising the steps of:

preparing a first member and a second member, each of said first member and said second member having one side face in parallel to another side face and having a plate projecting beyond an end portion of said first and second members along said one side face,

carrying out a friction stir welding of said plates of said first and second members under a condition where a rotary tool is inserted to said plates from said another side face, and

thereafter, welding respective end portions of a second plate to said another face side of said first and second members from an outer side of said first member and said second member.

38. Product formed by the method of claim 37.

39. A structure body, comprising:

a plate of an end portion of a first member and a plate of an end portion of a second member are welded by a friction stir welding,

said first member and said second member each include one side face substantially in parallel,

said plates project beyond end portions of said members along to said one side face,

said plates are welded from a direction of another side face of the first and second members by the friction stir welding, and

respective end portions of another plate are welded to said another side face of said first and second members.

40. A welding method, comprising the steps of:

abutting an end portion of a first member and an end portion of a second member, to provide an abutted portion,

each of said first member and said second member having a first plate, a second plate arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

said end part of said first plate projecting beyond said end part of said second plate, wherein in said abutted portion end parts of the first plates of the first and second members abut each other;

welding abutting portions of said first plates of said first and second members together from a side of said second plates; and

thereafter, welding end portions of a fourth plate to end parts of said second plates of said first and second members from an outer side of said first member and said second member.

41. A manufacturing method of a structure body, comprising the steps of:

abutting an end portion of a first member and an end portion of a second member, to provide an abutted portion,

each of said first member and said second member having a first plate, a second plate arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

said end part of said first plate projecting beyond said end part of said second plate, wherein in said abutted portion end parts of the first plates of the first and second members abut each other;

welding abutting portions of said first plates of said first and second members together from a side of said second plates;

thereafter, welding end portions of a fourth plate to end parts of the second plates of said first and second members from an outer side of said first member and said second member, to thereby form a welded body; and

by positioning the welded body with the first plates in an outer face of the structure body, manufacturing the structure body.

42. A manufacturing method of a vehicle structure body, comprising the steps of:

abutting an end portion of a first member and an end portion of a second member,

each of said first member and said second member having a first plate, a second plate arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

said end part of said first plate projecting beyond said end part of said second plate, wherein in said abutted portion, end parts of the first plates of the first and second members abut each other;

welding abutting portions of said first plates of said first and second members together from a side of said second plates;

thereafter, welding end portions of a fourth plate to the end parts of said second plates of said first and second members from an outer side of said first member and said second member, to thereby form a welded body; and

by positioning the welded body with the first plates in an outer face of the vehicle, manufacturing the vehicle structure body.

43. A welding method, comprising the steps of:

preparing a first member and a second member,

each of said first member and said second member having one face in parallel to another face and having a plate projecting beyond an end portion along to a side of said one face;

welding said plates of said first and second members from a side of said another face; and

thereafter, welding respective end portions of a second plate to said another face of said first and second members from an outer side of said first member and said second member.

44. Product formed by the method of claim 43.

45. Vehicle structure body formed by the manufacturing method of claim 42.

46. Structure body formed by the manufacturing method of claim 41.

47. Product formed by the welding method of claim 40.

48. A structure body, comprising:

a first member and a second member, each having a first plate, a second plate arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

said end part of said first plate of each of said first and second members projecting beyond a side of said end part of said second plate,

said end part of said first plates being welded from a side of said second plate,

respective end portions of a fourth plate are welded to said second plates of said first and second members, and

the structure body is formed by directing a side of said second plate to an inner side of the structure body.

49. A structure body, comprising:

a first member and a second member, each having a first plate, a second plate arranged substantially in parallel to said first plate, and a third

plate connecting a midway of an end part of said first plate to an end part of said second plate,

said end part of said first plate projecting beyond said end part of said second plate,

said end portions of said first plates being welded from a side of said second plate, and in a welding portion an opposite side of said first plates is substantially flat,

respective end portions of a fourth plate are welded to said second plates of said first and second members, and

the structure body is formed by directing a side of said second plates to an inner side of the structure body.

50. A vehicle structure body, comprising:

a first member and a second member, each having a first plate, a second plate arranged substantially in parallel to said first plate, and a third plate connecting a midway of an end part of said first plate to an end part of said second plate,

said end part of said first plate projecting beyond said end part of said second plate,

said end parts of said first plate being welded from a side of said second plates, and in a welding portion an opposite side of said first plate is formed substantially flat,

said respective end portions of a fourth plate are welded to said second plates of said first and second members, and



the structure body is formed by directing a side of said second plate to an inner side of the vehicle structure body.

51. A structure body, comprising:

a plate of an end portion of a first member and a plate of an end portion of a second member are welded,

in each of said first member and said second member, one face and another face are substantially in parallel,

said plate is projected beyond one end of said member along to a side of said one face, and

respective end portions of a second plate are welded to a side of said another face of said first and second members.